SOME UPPER TRIASSIC HEMIPTERA FROM QUEENSLAND

J. W. Evans

Australian Museum, Sydney

Fossil insects are known from two localities in Southern Queensland, one in the neighbourhood of Ipswich and the other at Mt. Crosby, and the insect-bearing strata in both areas are of Upper Triassic age.

In this article particulars are given of a collection of 41 wings of fossil Hemiptera from the Mt. Crosby beds. These have been made available to me for study by Mr. F. A. Perkins of the Entomology Department of the University of Queensland to whom thanks are expressed. The present collection brings the total number of wings of Hemiptera recorded from the Upper Triassic of Queensland to 106. Of this number 6 are of cicadoids, 32 cicadelloids, 36 cercopoids and 32 Heteroptera (Tillyard, 1918, 1919, 1921, 1922, 1923, Evans, 1956).

Many of the specimens in the new collection are of species which have been described previously but several of these, nevertheless, are of greater interest than those specimens which represent new species. This is because they provide hitherto unrecorded information of special significance.

Superfamily CICADELLOIDEA

In the majority of described forewings of Upper Permian cicadelloids and in several Triassic ones, the 2 principal branches of *M* are not linked by a cross-vein. Such a cross-vein, which forms a closed cell is, however, present in the forewings of some cicadelloids described from the Triassic of Queensland and the Jurassic of Europe. Formerly I have regarded this characteristic as of special importance, and have used it, together with other features, in defining a Family, the Chiliocyclidae (Evans, 1956).

The genus, *Chiliocycla* Tillyard is, in a later section of this work, transferred to the Cercopoidea hence this family name is no longer an appropriate one to comprise cicadelloids.

The establishment of family groupings based solely on wings is often a matter more of convenience than an expression of known evolutionary distinctiveness. Accordingly, and because the presence of a cell enclosed by the branches of *M* may in fact lack special significance, the wings of all cicadelloids which are illustrated in the following pages are ascribed to species and to genera but not to particular Families. Furthermore, since the true limits of genera based solely on wing venation must in most instances remain uncertain, and in order to avoid unessential generic nomenclature, such species as are described below as new are all ascribed to previously described genera.

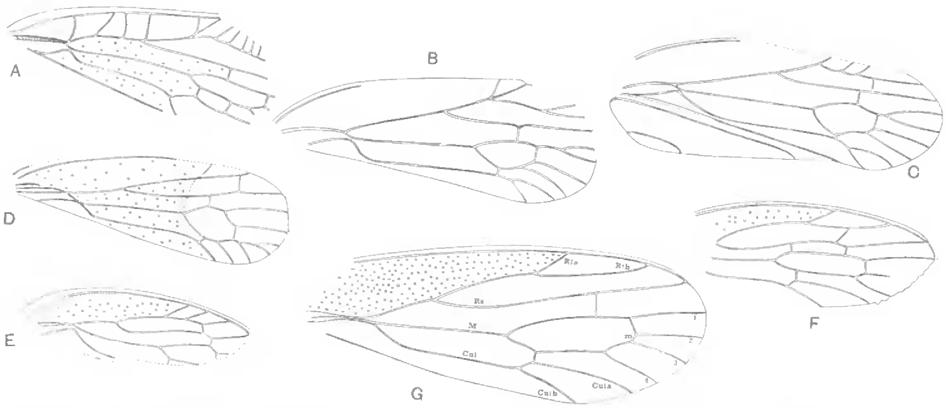

Figure 1. A, *Mesocicadella punctata* ; B, *Mesothymbris perkinsi* ; C, *M. perkinsi* ; D, *Hylicella colorata* ; E, *Triassocotis australis* ; F, *Triassocotis stricta* ; G, *Triassocotis amplicata*.

MESOCICADELLA Evans

Aust. J. Zool, 1956, 4, p. 193

TYPE SPECIES.—*Mesocicadella venosa* Evans.

MESOCICADELLA PUNCTATA sp. nov.

Figure 1, A

Length of fragment, 15·5 mm.; greatest width, 6 mm. Surface of tegmen proximally, but of uncertain distal extension, finely punctate.

Holotype tegmen F. 3681, Queensland Museum.

M. punctata resembles the type species in the presence of numerous costal veinlets. It differs in having the veins apically simple instead of being multi-branched.

MESOTHYMBRIS Evans

Aust. J. Zool, 1956, 4, p. 191

TYPE SPECIES.—*Mesothymbris perkinsi* Evans.

MESOTHYMBRIS PERKINSI Evans

Figures 1, B, C

Mesothymbris perkinsi Evans, 1956, *Aust. J. Zool*, 4, p. 191.

Four specimens are ascribed to this species.

Figure 1, B. F. 3684, Queensland Museum. Length of tegmen, 9 mm.; greatest width, 3·2 mm.; surface indeterminate. Differs from the Holotype tegmen in having 2 less veinlets between R_1a and R_1b and in having a cross-vein between the anterior and posterior branches of M.

Figure 1, C. F. 3682, counterpart F. 3683, Queensland Museum. Length of tegmen, 9 mm.; greatest width, 3 mm.; surface, especially the clavus, punctate. Differs from the Holotype tegmen in being more complete, in having an enclosed cell between the anterior and posterior branches of M and in minor details in respect to the branching of R_1. Two unfigured specimens (12 and S1, S1A, Department of Entomology, University of Queensland), both 9 mm. in length. In the former, R_1a and R_1b are present as single veins, while in the latter there are 2 additional veinlets between R_1a and R_1b. S1, S1A, has a fragment of a hind-wing on the same piece of rock.

MESOTHYMBRIS WOODWARDI Evans

Mesothymbris woodwardi Evans, 1956, *Aust. J. Zool*, 4, p. 191.

S. 18 Department of Entomology, University of Queensland. Length of tegmen, 7 mm.; greatest width, 3 mm.

HYLICELLA Evans

Aust. J. Zool, 1956, 4, p. 195

Type species.—*Hylicella colorata* Evans.

HYLICELLA COLORATA Evans

Figure 1, D

Hylicella colorata Evans, 1956, *Aust. J. Zool*, 4, p. 195.

Five specimens are ascribed to this species.

F. 3686, Queensland Museum. Length of tegmen, 12 mm.; greatest width, 4 mm.; surface of basal two-thirds, coriaceous, punctate. In the description of the Holotype tegmen it was stated that it had an apparent nodal line, although this was not shown in the accompanying illustration. Such a transverse division of the tegmen, which may represent no more than a change of texture, is shown in figure 1, D. This tegmen differs from the Holotype in having only a single cross-vein r and in the presence of an additional vein between the arms of Cu_1a and Cu_1b.

Other specimens (Department of Entomology, University of Queensland) (6), 11 mm.; venation as in figure 1, D; (2, 2A), 11 mm.; venation as in Holotype; (3, 24), basal two-thirds of tegmen.

TRIASSOSCELIS ANOMOLA Evans

Triassoscelis anomola Evans, 1956, *Aust. J. Zool*, 4, p. 192.

1, 1A, Department of Entomology, University of Queensland.

TRIASSOCOTIS Evans

Aust. J. Zool, 1956, 4, p. 194.

TYPE SPECIES.—*Triassocotis australis* Evans.

TRIASSOCOTIS AUSTRALIS Evans

Figure 1, E

Triassocotis australis Evans, 1956, *Aust. J. Zool*, 4, p. 194.

F. 3687, Queensland Museum. Length of fragment, 6 mm. Costal area of impression of ventral surface of tegmen, coarsely punctate. Differs from the Holotype tegmen in having an additional branch of R_1 and in the more distal position of cross-vein $r-m$.

TRIASSOCOTIS STRICTA sp. nov.

Figure 1, F

Length of tegmen, 8·2 mm.; costal area coarsely punctate. Holotype F. 3688, Queensland Museum.

Differs from the tegmen of *T. australis* in R_1 having only 2 branches, the greater proportional length of *Rs*, the presence of an additional cross-vein $r-m$ and in *M* having 4 instead of 3 apical branches.

TRIASSOCOTIS AMPLICATA sp. nov.

Figure 1, G

Length of tegmen, 12 mm.; greatest width, 4 mm.; costal area coarsely punctate.

Holotype, F. 3689, Queensland Museum.

Differs from the tegmen of the type species, and that of *T. stricta*, in size; in the more rounded apex; from the former in R_1 having 2 instead of 4 branches and from the latter in *M* having 3 instead of 4 apical branches.

Superfamily CERCOPOIDEA

Formerly the forewings of 8 species of Australian fossil Homoptera have been ascribed to this Superfamily and they have been placed in 7 genera comprised in 3 families, of which two are extinct (Evans, 1956, 1958). The wings of seven of these insects came from Upper Triassic strata in Queensland, while one was from the Belmont beds in New South Wales, which are of Permian age.

Opinions differ in respect to the correct systematic position of some of these fossils. Thus, Bekker-Migdisova (1949) has described the wing of an insect from Upper Triassic deposits in central Asia (*Mesotracis reducta* B.M.) which she has ascribed to the family Flatidae (Fulgoroidea). This wing very closely resembles that of *Dysmorphoptiloides elongata* Evans, from the Upper Triassic of Queensland, which I have regarded as that of a cercopoid (Evans, 1956, 1957). Another wing, also from the Mt. Crosby beds, which I had ascribed to the Cercopoidea (Evans, 1956) but not named, since it is known only from an illustration, the whereabouts of the figured specimen being unknown, has been named *Prosbolopsites tillyardi* by Bekker-Migdisova (1960) who regards the insect from which it was derived as being of uncertain position.

It is necessary, because of these differences of interpretation, before describing fossil wings which supposedly belonged to the Cercopoidea, once more to discuss certain features of the forewings of Recent representatives of this superfamily.

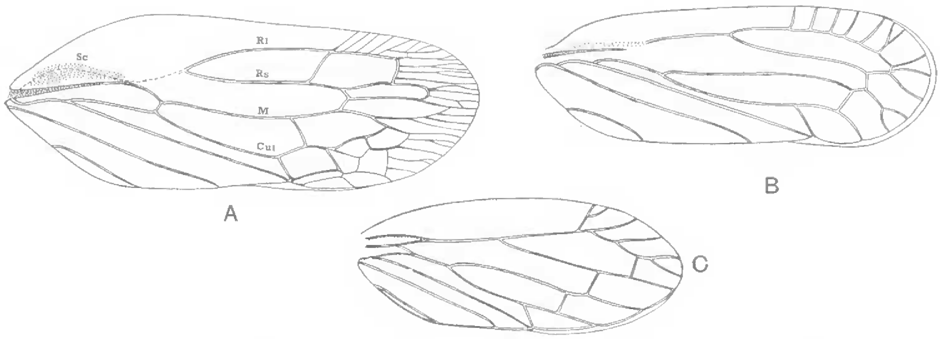

Figure 2. A, *Cosmoscarta incanescens* (Butler) ; B, *Hemitriecphora variabilis* (Distant) ; C, *Aufidus tripars* Walker

The tegmina of 3 Recent cercopoids are illustrated in figure 2, and attention is drawn to the following features : an extensive costal area ; a short *Sc* which curves distally towards the base of *R* ; a multi-branched R_1, of which some of the branches may be at right angles and others parallel with the costal margin ; *Rs* arising from *R* nearer to the base of the tegmen than the apex and sometimes meeting with R_1 ante-apically ; *M* with 2 apical branches, as a single vein, or, in a reticulate condition and either linked to Cu_1 by a cross-vein, or else, proximally incorporated in the same vein as Cu_1 ; Cu_1a long and curved. An additional important characteristic of the tegmina of cercopoids is that they may be coarsely punctate and rugose.

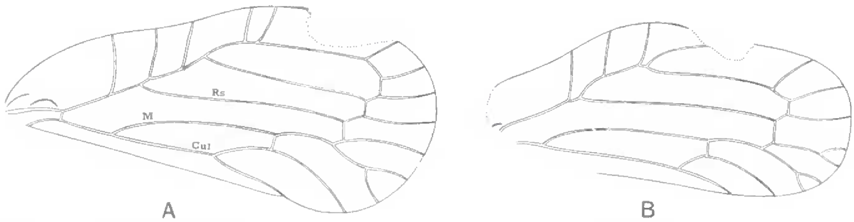

Figure 3. A, *Trifidella perfecta* ; B, *T. perfecta* ;

Family **CERCOPIDAE**

TRIFIDELLA Evans

Aust. J. Zool, 1956, 4, p. 215

TYPE SPECIES.—*Trifidella perfecta* Evans.

TRIFIDELLA PERFECTA Evans

Figure 3, A, B

Trifidella perfecta Evans, 1956, Aust. J. Zool, 4, p. 216.

Figure 3A. F. 3690, counterpart F. 3691, Queensland Museum.

Length of tegmen, 8 mm.; greatest width, 3·8 mm.; surface coarsely rugose. Differs from Holotype tegmen principally in the absence of M_1 and M_2 as short, separate veins, in having M_3 and M_4 more fully developed and in having the base of $M + Cu_1$ separated from R by a cross-vein.

Figure 3, B. F. 3692, Queensland Museum. Length of tegmen, 7 mm.; whole tegmen coarsely rugose.

Family **DYSMORPHOPTILIDAE**

DYSMORPHOPTILOIDES Evans

Aust. J. Zool, 1956, 4, p. 218

TYPE SPECIES.—*Dysmorphoptiloides elongata* Evans.

DYSMORPHOPTILOIDES ELONGATA Evans

Dysmorphoptiloides elongata Evans, 1956, *Aust. J. Zool*, 4, p. 219.

There are 6 wings of this species in the collection, but none differs appreciably from those previously illustrated : 16, 16A ; S3, S3A ; S14, S14A ; S2 ; S7, S7A ; 14 (Department of Entomology, University of Queensland).

Family **EOSCARTERELLIDAE**

EOSCARTERELLA Evans

Aust. J. Zool, 1956, 4, p. 220.

Type species.—*Eoscarterella media* Evans.

EOSCARTERELLA MEDIA Evans

Eoscarterella media Evans, 1956, *Aust. J. Zool*, 4, p. 221.

Prosbolopsites tillyardi Bekker-Migdisova, 1960 76, p. 90 (syn. nov.)

S8, S8A, Department of Entomology, University of Queensland. Length of tegmen, 10 mm.; greatest width 5 mm., surface rugose. It now seems certain that the wing illustrated, but not named, by Tillyard (Tillyard, 1936) was that of an insect belonging to the same species as that described by me as *Eoscarterella media*.

The additional specimen of the tegmen recorded above is not figured because the venation is, in part, confused by the presence of an underlying hind wing. It is, however, sufficiently distinct to enable it to be seen that $M_1 + {}_2$ form a single vein and that M_3 and M_4 are separate veins. It thus presents a venational condition which is intermediate between Tillyard's illustration and that figured for the holotype of *E. media*.

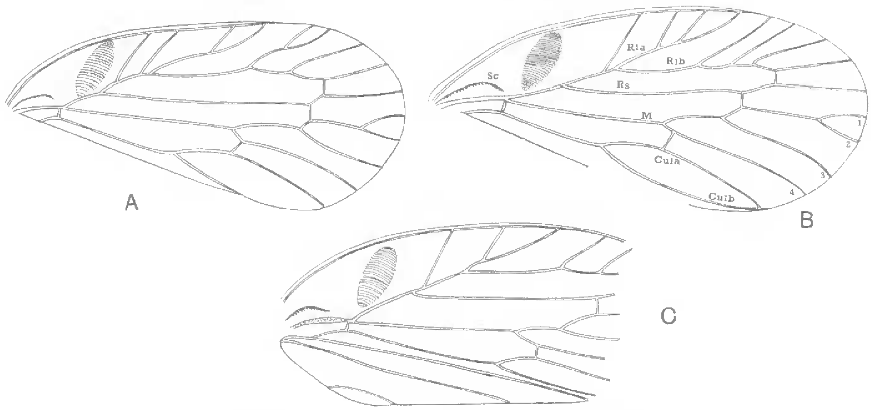

Figure 4. A, *Eoscartoides bryani ;* B, *E. bryani ;* C, *E. bryani.*

EOSCARTOIDES Evans

Aust. J. Zool, 1956, 4, p. 220

Type species.—*Eoscartoides bryani* Evans.

EOSCARTOIDES BRYANI Evans

Figures 4, A, B, C

Eoscartoides bryani Evans, 1956, *Aust. J.* Zool, 4, p. 221.

Eleven wings of insects belonging to this species are contained in the collection. Every one of them has a feature which was not noticed at the time the original description was made. This is the presence, in the proximal costal area of the tegmen, of a well-defined, striated, stridulating area. An examination of several Recent cercopoids has disclosed no trace of the existence of such an area. It would seem that stridulation could take place by the rubbing of the apices of the hind femora against the under surface of the tegmina.

Figure 4, A. F. 3693, counterpart F. 3694, Queensland Museum. Length of tegmen, 12 mm.; greatest width, 5 mm.; surface of tegmen evenly, finely, punctate.

Figure 4, B. F. 3695, counterpart F. 3696, Queensland Museum. Length of tegmen, 12 mm.; greatest width 5 mm.

Figure 4, C. F. 3697, counterpart F. 3698, Queensland Museum. Length of fragment, 10 mm. Clavus present with separate anal veins.

The 3 tegmina which are illustrated differ from those of the holotype tegmen in being more complete and in having some additional cross-veins. Specimens in Department of Entomology, University of Queensland : S4, S5, S5A, S9 ; S10, S10A, S13, S13A, S15 ; S17, S17A, S19, S19A.

Family CHILIOCYCLIDAE

CHILIOCYCLA Tillyard

Proc. Linn Soc., N. S. W., 1919, 44, p. 868

Type species.—*Chiliocycla scolopoides* Tillyard.

CHILIOCYCLA SCOLOPOIDES Tillyard

Chiliocycla scolopoides Tillyard, 1919, *Proc. Linn. Soc. N.S.W.*, 44, p. 868.

Chiliocyla scolopoides Tillyard, 1923, *Proc. Linn. Soc. N.S.W.*, 47, p. 460.

Chiliocycla scolopoides Tillyard, Evans, 1956, *Aust. J. Zool.*, 4, p. 209.

The position of this insect, which is known by the existence of 2 tegmina described by Tillyard from the Ipswich beds has long been problematical. Tillyard placed it in the Scytinopteridae and formerly, though recognizing that it seemed to have certain cercopoid features, I have likewise regarded it as belonging to the Cicadelloidea. Further consideration, and the study of other fossil tegmina, suggests that it is best regarded as the wing of a cercopoid for the following reasons : the tuberculate surface ; the possible presence of a distinct, short *Sc* ; *Rs*. arising from *R*, nearer to the base of the tegmen than the apex ; the presence of a proximal cross-vein $m-u$; the shape of the arms of Cu_1. It is assumed that the cell enclosed by the arms of M represents a development parallel with a similar one found in certain Triassic and Jurassic cicadelloids and does not denote close relationship.

DISCUSSION OF THE CERCOPOIDEA

The principal characteristics of the tegmina of Recent cercopoids have already been discussed and illustrated. Attention is drawn to the following resemblances between the tegmina of some living cercopoids and those of insects which are believed to have belonged to the same superfamily : coarse texture ; extensive basal costal area ; R_1 with numerous branches ; early departure of Rs from R ; R_1 and Rs sometimes confluent ante-apically ; basal fusion of M and Cu_1 or, if these veins are separate, their attachment to each other by a basal cross-vein ; curved shape of Cu_1a.

It is claimed that the tegmina which have been ascribed above to the Cercopoidea cannot have been those of either cicadelloids or fulgoroids for the following reasons : while the surface of the insects in both these groups may be coriaceous and punctate, they are never coarsely rugose ; in cicadelloids Rs usually arises from R in a more distal position and when the separation of these 2 veins is proximally situated (as for example in *Hylicella colorata*) then R_1 is less extensive ; while in Permain and Triassic cicadelloids M may be basally associated with R, as it is also in most Recent forms, it is never, except in the Membracidae, basally fused with Cu_1. Moreover, in generalised membracids R, M and Cu_1 are distinct for the whole of their lengths and R_1 never has more than 2 branches. While in the Fulgoroidea R_1 may be multi-branched and Rs depart from R nearer to the base of the tegmen than the apex, M is almost invariably multi-branched. In the fossils under discussion M however shows a trend in the direction of reduction and not of increase. Finally, in generalised Fulgoroids M is always separate from Cu_1 and the latter vein usually separates into Cu_1a and Cu_1b in a proximal position. Some Fulgoroids stridulate and no Recent cercopoids have been recorded as doing this, but this factor need not be of any phylogenetic significance.

Suborder **HETEROPTERA**

Family **ACTINOSCYTINIDAE**

PLATYSCYTINELLA Evans

Aust. J. Zool, 1956, 4, p. 245

TYPE SPECIES.—*Platyscytinella paradoxa* Evans.

PLALYSCYTINELLA PARADOXA Evens

Platyscytinella paradoxa Evans, 1956, *Aust. J. Zool.*, 4, p. 245.

10, 10a, Department of Entomology, University of Queensland.

HETEROSCYTINA Evans

Aust. J. Zool, 1956, 4, p. 245

TYPE SPECIES.—*Heteroscytina tillyardi* Evans.

HETEROSCYTINA TILLYARDI Evans

Heteroscytina tillyardi Evans, 1956, *Aust. J. Zool.*, 4, p. 256.

21, 21A ; 23, 23A, Department of Entomology, University of Queensland.

Two insects, which almost certainly belong to the family Actinoscytinidae, have been described from the Triassic of Central Asia and named *Olgamartynovia turanica* B.M. and *Cicadocoris kuliki* B.M. (Bekker-Migdisova, 1958). They have been placed by the author in the family Cicadocoridae, which she ascribed to the Homoptera, Coleorhyncha.

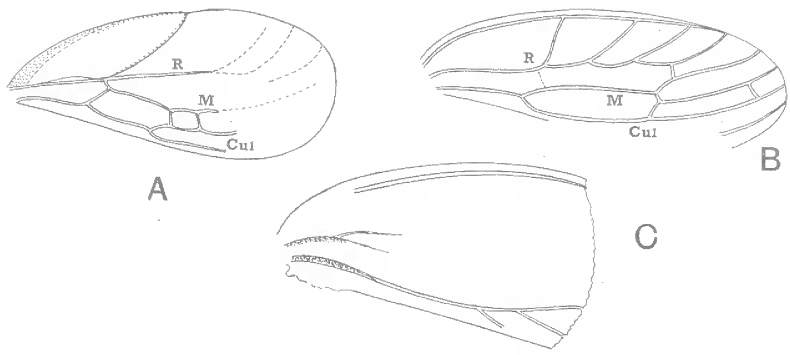

Figure 5. A, *Heteronella marksei* ; B, *Heterojassus membranaceus* ; C, fragment.

HETERONELLA gen. nov.

Upper Triassic Heteroptera from Queensland having a well defined costal fracture in the tegmen (Evans, 1950) and with the venation distinct in the basal half of the tegmen only. In the distal half, the veins, which are indistinct, curve towards the costal margin of the tegmen. *R* is well defined basally and is proximally incorporated in the same vein as *M*. Apically, *R* seems to have 3 branches and *M* to be a single vein. The 2 branches of Cu_1 are elongated and Cu_1 is joined to *M* by a wide cross-vein.

TYPE SPECIES.—*Heteronella marksei* sp. nov.

HETERONELLA MARKSEI sp. nov.

Figure, 5, A

Holotype tegmen, F. 3699, counterpart F. 3700, Queensland Museum.

Length of tegmen, 3·8 mm.; greatest width, 2 mm. It is possible that this forewing may be that of a saldid or an ochterid.

HETEROJASSUS gen. nov.

Upper Triassic Heteroptera from Queensland with membranous tegmina in which R is multi-branched and M and Cu_1 basally form a single vein. There is an enclosed elongate cell between M and Cu_1 and a wide appendix. All the veins curve towards the anterior corner of the apex of the tegmen.

TYPE SPECIES.—*Heterojassus membranaceus* sp. nov.

HETEROJASSUS MEMBRANACEUS sp. nov.

Figure 5, B

Holotype tegmen, F. 3701, Queensland Museum. Length of tegmen, 5·1 mm.

Superficially this wing might seem to be that of a representative of the Homoptera rather than of the Heteroptera. The lack of Rs and the apical directional trend of the veins suggest, however, Heteropterous, rather than Homopterous affinities.

Figure 5, C. F. 3702, Queensland Museum. A fragment of the forewing of a Heteropteron, 5·4 mm. in length, which lacks sufficient characters to justify it being named.

LITERATURE CITED

Bekker-Migdisova, E. E., 1958. Materialy k. Osnovam Paleontol., 2, p. 58.

————, 1960. Trudy Paleontol. Inst. Akad. Nauk. S.S.S.R., 76, p. 91.

Evans, J. W., 1950. A re-examination of an Upper Permain insect, *Paraknightia magnifica*. *Rec. Aust. Mus.*, 22, p. 246.

————, 1956. Palaeozoic and Mesozoic Hemiptera, *Aust. J. Zool.*, 4, p. 165.

————, 1958. New Upper Permain Homoptera from the Belmont Beds, *Rec. Aust. Mus.*, 24, p. 113.

Tillyard, R. J., 1918. Mesozoic Insects of Queensland, No. 4. *Proc. Linn. Soc. N.S.W.*, 43, p. 568.

————, 1919. Mesozoic Insects of Queensland, No. 7 *Proc. Linn. Soc. N.S.W.*, 44, p. 137.

————, 1921. Mesozoic Insects of Queensland, No. 8. *Proc. Linn. Soc. N.S.W.*, 46, p. 177.

————, 1922. Mesozoic Insects of Queensland, No. 9. *Proc. Linn. Soc. N.S.W.*, 47, p. 447.

————, Mesozoic Insects of Queensland, No. 10. *Proc. Linn. Soc. N.S.W.*, 48, p. 217.

S. G. REID, Government Printer, Brisbane